

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue Application of:)
Olivier M. PARRIAUX) Atty. Docket: **ICB0166**
Reissue Serial No. Not Yet Assigned) Group Art Unit: 2877
Reissue Filed: March 18, 2004) Examiner: Unknown
Original Patent No. 6,359,691 B2)
Issued: March 19, 2002)
For: DEVICE FOR MEASURING TRANS-) Date: March 18, 2004
LATION, ROTATION OR VELOCITY)
VIA LIGHT BEAM INTERFERENCE)

37 CFR § 1.175 DECLARATION FOR REISSUE APPLICATION

MAILSTOP REISSUE APPLICATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, OLIVIER M. PARRIAUX, declare as follows:

1. I am a citizen of Switzerland and my residence address and post office address are stated below my signature to this Declaration.
2. I am the named inventor of U.S. Patent 6,359,691 B2 entitled "DEVICE FOR MEASURING TRANSLATION, ROTATION OR VELOCITY VIA LIGHT BEAM INTERFERENCE" (hereafter, the "'691 Patent"), which issued on March 19, 2002 from U.S. Patent Application Serial No. 09/788,444, filed February 21, 2001 as a continuation of application No. PCT/EP99/06057, filed on August 19, 1999.
3. I am the sole owner of the '691 Patent.

4. I am the original, first and sole inventor of the invention entitled “DEVICE FOR MEASURING TRANSLATION, ROTATION OR VELOCITY VIA LIGHT BEAM INTERFERENCE” (as amended), described and claimed in the above-identified ‘691 Patent, and for which invention I solicit a reissue patent. I have reviewed and understand the contents of the ‘691 Patent, including the original claims and the new claim added in the reissue application, and the original claims as amended by Preliminary Amendment (A) to the reissue application. I am the first and original inventor of the subject matter that is claimed and for which a reissue patent is sought. I do not know and do not believe the same was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof, or more than one year prior to the application for the patent. The invention for which a reissue patent is sought was not in public use or on sale in the United States of America more than one year prior to the application for the patent. The invention has not been patented or made the subject of an inventor’s certificate issued before the date of application for the patent in any country foreign to the United States of America on an application filed by myself or by my legal representatives more than twelve months prior to the application for the patent. Lastly, I acknowledge my duty to disclose information of which I am aware and that is material to the examination of this application.

5. I believe the original U.S. Patent No. 6,359,691 B2 to be, through error and without deceptive intent, wholly or partly inoperative or invalid, by reasons of my claiming, in certain respects, more than I had a right to claim in the original patent. Specifically, I now believe that the descriptive language in claim 1 of the original patent,

pertaining to the diffraction of the light beam by the components of the diffraction grating assembly, is overbroad.

6. I believe the original U.S. Patent No. 6,359,691 B2 to be, through error and without deceptive intent, wholly or partly inoperative or invalid, by reasons of my claiming, in certain respects, less than I had a right to claim in the original patent. Specifically, I now believe that I had the right to claim the relative mobile relationship between the first and second grating assemblies as supported in col. 2, lines 25-51, wherein the first grating assembly is broadly mobile relative to the second grating assembly. In particular, when one of these two grating assemblies is arranged in a fixed manner, it could be either the first grating assembly or the second grating assembly that is fixed. In addition, I specifically now believe that I had the right to claim in the original patent not only claims 1-33, which are present in the issued '691 Patent, but also new claim 34 included in this reissue application.

7. These errors arose without deceptive intent during the preparation and prosecution of the original '691 Patent. In particular, I did not fully appreciate the breadth of the recitation, in claim 1 of the '691 Patent, of how the fixed reflective grating assembly and the mobile grating assembly "diffract a portion of the incident light beam thereby producing interference and the resultant portion of the incident light beam" that is detected by the light detector. In accordance with all embodiments of the present invention, the recited structures more narrowly result in the incident light beam reaching the first grating assembly where it is partially diffracted along two different directions thereby forming two partial light beams which then reach the second grating assembly and, thereafter, the first grating assembly,

thereby forming, after diffraction by this first grating assembly, the resultant interference beam that results from an interference of the two partial light beams along an output direction.

8. In addition, during the preparation and prosecution of the original '691 Patent, I did not appreciate the unnecessary limiting effect of reciting fixed and mobile grating assemblies in claim 1 of the '691 Patent. Specifically, the broadest embodiment in accordance with the present invention does not require that either the first or second grating assemblies be "fixed," but only that the first grating assembly be mobile relative to the second grating assembly.

9. Also during the preparation and prosecution of the original '691 Patent, I did not realize that a certain embodiment was not included in the claims. Specifically, I did not realize during prosecution that the embodiment wherein the detector and the light source are both integrated in a semiconductor substrate bearing the second grating assembly had not been included in the claims of the '691 Patent.

10. At the time the original '691 Patent was drafted and prosecuted, I had independently engineered my invention. My native language is French. The prosecution of the original '691 Patent proceeded in English through my European Agent, Ingenieurs Conseils en Brevets, S.A. (hereafter, "ICB"), and their American associates. As a result of prosecuting my patent from overseas, a misunderstanding arose as to the scope of the present invention when the claims were redrafted to comply with U.S. standards of definiteness under 35 U.S.C. § 112. The redrafted claims were overly broad in certain respects and overly narrow in others. These redrafted claims became the claims of the '691 Patent. Had I been

aware of and fully understood the scope of the claims newly drafted during prosecution of the original application, I would have directed the patent attorneys to prepare claims of proper scope.

11. Prior to the issuance of the '691 Patent, I did not have the opportunity to review the claims as amended during the prosecution of the original application. Therefore, I did not fully appreciate how the allowed claims had deviated from the scope I had intended.

12. Subsequent to the issuance of the '691 Patent, I had opportunity to review the claims and to study them. During this review, I became aware that the scope of the claims was not as I had intended. After meeting with a member of ICB, it became clear to me that the claims of the '691 Patent were overly broad in certain respects, and too narrow in others. In addition, I realized that the embodiment wherein the light source is integrated in a semiconductor substrate bearing the second grating assembly had not been claimed.

13. I believe that I am entitled to amend the claims of the '691 Patent so as to narrow the scope of the language regarding the diffraction of the incident light beam by the first and second assemblies, and to broaden the scope of the language describing these two assemblies, as are fully supported by the original disclosure of U.S. Application Serial No. 09/788,444, which resulted in the '691 Patent.

14. I believe that I am entitled to make the new claim 34 as it is fully supported by the original disclosure of U.S. Application Serial No. 09/788,444, which resulted in the '691 Patent.

15. In my original patent, there is no claim that is of the same scope as any of the amended claims 1-14, 17, 19, 22, 23, 26-28, 30, 32 and 33, and the newly added claim 34. The differences in scope are emphasized by showing how each of the amended claims 1-14, 17, 19, 22, 23, 26-28, 30, 32 and 33 differ from the corresponding original claims of the '691 Patent. In addition, the difference in scope between new claim 34 and the original claims is emphasized by comparing new claim 34 to the original claims 1 through 33 of the '691 Patent. Such comparison, set forth in paragraphs 16 through 29, specifies excesses and insufficiencies of my original patent claims. However, the Examiner is encouraged to compare the language of the original claims with the language of the new claims to fully appreciate all of the differences between the claims.

16. Amended claim 1 is directed to a device utilizing light diffraction for measuring translation, rotation or velocity comprising a diffraction grating assembly that includes a first reflective grating assembly and a second reflective grating assembly wherein the first grating assembly is mobile relative to the second grating assembly. There is no language to suggest that either the first grating assembly or the second grating assembly is fixed. Original claims 1-33 do not describe this aspect of the invention. In most cases, one of the two grating assemblies is fixed, but which one is not relevant to the invention. However, in a preferred embodiment (i.e., claim 4), the first grating assembly is mobile and the second grating assembly is fixed. So, original independent claim 1 recites a diffraction grating assembly comprising a fixed reflective grating assembly and a mobile reflective grating assembly, which includes a limitation not present in amended claim 1. Amended claim 1 also recites that the first and second grating assemblies are arranged to diffract at

least a portion of the incident light beam so that the incident light beam reaching the first grating assembly is partially diffracted along two different directions thereby forming two partial light beams which then reach the second grating assembly and, thereafter, the first grating assembly, thereby forming, after diffraction by the first grating assembly, the resultant interference beam that results from interference of the two partial light beams along an output direction. In contrast, independent claim 1 of the '691 patent does not contain language so narrowly defining the formation of the resultant interference beam.

17. Amended claims 2-4, 8, 13, 14, 17, and 19 each depends upon amended claim 1, and these claims are amended to maintain consistency of language and proper antecedent basis in view of the preceding amendments to claim 1.

18. Amended claims 5 and 9 each depends upon amended claim 4, and these claims are amended to maintain consistency of language and proper antecedent basis in view of the preceding amendments to claims 1 and 4.

19. Amended claims 6 and 7 each depends upon amended claim 5, and these claims are amended to maintain consistency of language and proper antecedent basis in view of the preceding amendments to claims 1, 4 and 5.

20. Amended claims 10 and 27 each depends upon amended claim 8, and these claims are amended to maintain consistency of language and proper antecedent basis in view of the preceding amendments to claims 1 and 8.

21. Amended claim 11 depends upon amended claim 9, and claim 11 is amended to maintain consistency of language and proper antecedent basis in view of the preceding amendments to claims 1, 4 and 9.

22. Amended claim 12 depends upon amended claim 10, and claim 12 is amended to maintain consistency of language and proper antecedent basis in view of the preceding amendments to claims 1, 8 and 10.

23. Amended claims 22, 26 and 32 each depends upon amended claim 2, and these claims are amended to maintain consistency of language and proper antecedent basis in view of the preceding amendments to claims 1 and 2. Furthermore, claim 32 has been amended to recite that the first reflective surface is arranged to deviate a first beam originating from the source and propagating substantially along a displacement direction of the second reflective grating. Original claims 1-33 do not describe this aspect of the invention.

24. Amended claim 23 depends upon amended claim 3, and claim 23 has been amended to maintain consistency of language and proper antecedent basis in view of the preceding amendments to claims 1 and 3.

25. Amended claim 28 depends upon amended claim 26, and claim 28 has been amended to maintain consistency of language and proper antecedent basis in view of the preceding amendments to claims 1, 2 and 26.

26. Amended claim 30 has been amended to depend upon claim 29 instead of claim 26 so as to recite a more fully developed embodiment. Original claims 1-33 do not describe this particular embodiment of the invention.

27. Amended claim 33 depends upon claim 32, and claim 33 has been amended to maintain consistency of language and proper antecedent basis in view of the preceding amendments to claims 1, 2 and 32.

28. New claim 34 depends upon amended claim 6 and recites that the light source is integrated in a semiconductor substrate bearing the second grating assembly. Original claims 1-33 do not describe this aspect of the invention.

29. Further differences between the amended claims 1-14, 17, 19, 22, 23, 26-28, 30, 32 and 33 and the original claims 1-33 will be apparent from a comparison of the language of the newly amended claims with the language of the original claims.

30. As specified in paragraphs 7-15, above, I became aware of the excesses and insufficiencies of my original patent claims in the latter part of 2003 after thoroughly reviewing the claims of the '691 Patent and discussing them with a member of ICB. At that time I first realized that through error, without deceptive intent, I had claimed in certain respects more than I had a right to claim in my original patent while at the same time I had claimed in other respects less than I had a right to claim.

31. At this time, I wish to clearly express that the scope of the present claims does not cover the embodiments shown in Figures 1 to 4 and Figure 8 of the '691 Patent. On the other hand, I believe that the scope of the present claims does cover the embodiments illustrated in the remaining figures of the '691 Patent. More particularly, Figure 1 illustrates, for example, a first diffraction grating (6) that is transmissive and not reflective. Transmissive diffraction gratings for the first and second gratings are not covered by the scope of the presently claimed invention. In contrast, the scope of amended claim 1 covers, inter alia, the embodiment shown in Figure 17 because first grating (90) and second grating (92, 92') are reflective gratings. The further transmissive grating (140) in this embodiment is associated with the source for generating incident beams FI and FI'.

32. However, the embodiment shown in Figure 5, for example, is covered by the scope of the present claims because the first and second diffraction gratings (62) and (70) are reflective diffraction gratings and are not transmissive diffraction gratings. This feature of the present invention, wherein only reflective diffraction gratings are used for the first and second gratings, is important because non-transmitting diffraction gratings (i.e., reflective diffraction gratings) can easily be made of silicon, which facilitates miniaturization and integration.

33. As shown in Figure 7 or 9, for example, the present invention permits the light source (72), the detector (74) and the second reflective diffraction grating (90) to be compactly manufactured as one small assembly located on one side of the scale (i.e., first reflective grating (62)), thereby permitting advantageous miniaturization and integration. The reason that integration can be achieved is because silicon can be used to make the reflective diffraction grating (92). The reason that silicon can easily be used to make the grating is because the diffraction grating does not have to be transparent to the light of the incident beam. Silicon is not transparent to light with a wavelength essentially smaller than one micrometer so transmissive gratings cannot be implemented in the same silicon substrate as a preferred detector, which is functional only for wavelengths essentially smaller than one micrometer.

34. As shown in Figure 5, for example, a further advantage of the first and second reflective gratings is that the second grating, which may have a relatively smaller pitch presents a relatively short length, and the mobile scale formed by the first grating is easier to manufacture than the second grating because of its relatively larger pitch.

35. At this time, I also wish to discuss two prior art references mentioned, and discussed, in the specification of the '691 Patent, namely U.S. Patent 5,424,833 to Huber et al. (hereafter, "Huber'833 Patent"), and European Patent EP 0 603 905 B1 (hereafter, the "EP'905 Patent"). The Huber'833 Patent is discussed in col. 1, lines 34-58, of the '691 Patent and the EP'905 Patent is discussed in col. 1, line 59, to col. 2, line 5, of the '691 Patent. I believe these prior art references deserve more careful consideration than given by the Examiner during the prosecution of the '691 Patent.

36. Specifically, the Huber'833 Patent contains subject matter similar to European Patent EP 0 590 162 A2 (hereafter, the "EP'162 Patent"), which was considered by the Examiner during prosecution of '691 Patent. Both the Huber'833 Patent and the EP'162 Patent derive priority from German Application No. 92116125.3, filed September 21, 1992, and each reference discloses a device for measuring linear or angular displacements. Both references teach a light source producing light beams that are transmitted through a first transparent grating assembly and reflected by a second reflective grating assembly. The pitch of the first grating assembly is greater than the pitch of the second grating assembly. Because the first grating assembly is transparent, it cannot be made of silicon except if the wavelength of the light source is larger than essentially one micrometer. This limitation is disadvantageous because it impedes miniaturization and integration in silicon of the first grating assembly with the light source and a preferred light detector, the latter absorbing only light with a wavelength essentially smaller than one micrometer. In addition, cheap small light sources (i.e., diodes) generally emit light with wavelengths essentially under one micrometer. Thus, miniaturized and integrated structures, such as illustrated, for example, in

Figure 7 or 9 of the '691 Patent, cannot be easily achieved using a light transmitting grating assembly. The present invention is distinguished from the teachings of the Huber'833 Patent and the EP'162 Patent, because the present invention has reflective not transmissive diffraction gratings for the first and second gratings, which can easily be made of silicon and miniaturized and integrated with the light source and the light detector.

37. There are other drawbacks to the devices taught by the Huber'833 Patent and the EP'162 Patent. In particular, the large pitch used for the first transmitting grating assembly and the relatively small pitch used for the second grating assembly is disadvantageous in that the second mobile grating with the relatively smaller pitch needs to be longer than the first fixed grating for detection of displacement of the second mobile grating relative to the first fixed grating to occur. On the other hand, when the pitches of the first and second gratings are different, the present invention, such as the embodiment shown in Figure 5, utilizes a relatively large pitch for the first reflective grating, which is preferably the mobile grating, and a relatively smaller pitch is used for the second reflective grating, which is fixed relative to the source and the detector.

38. Another distinguishing feature of the present invention over the apparatus taught by the Huber'833 Patent and the EP'162 Patent is that the light beams propagate in a plane perpendicular to the grating lines. Both the Huber'833 Patent and the EP'162 Patent teach that the incident and interference beams propagate in a plane that is parallel to the grating lines and perpendicular to the longitudinal direction of the scale. The arrangement of the light source, gratings and the light detector in accordance with the present invention results in the propagation of light beams in the plane perpendicular to the grating

lines and along the longitudinal direction of the scale. This feature is recited, for example, in claims 10-12.

39. The EP'905 Patent teaches a displacement detection apparatus that includes two diffraction gratings (G1) and (G2) formed on opposite sides of a scale (10) as shown in Figure 1. Light from a light emitting element (1) is transmitted and diffracted by grating (G1) then reflected by grating (G2) to a third light transmitting grating (G3) before being detected by light-receiving element (3). The apparatus taught by the EP'905 Patent is distinguished from the presently claimed invention in several ways. First, the EP'905 Patent teaches that the first and second diffraction gratings are manufactured on the same substrate so that both of these gratings are moved together relative to the detector and the source. Second, because grating (G1) is a light transmitting grating, it cannot be made of silicon for light having a wavelength essentially smaller than one micrometer, which negatively impairs the ability to miniaturize and to integrate this structure with the light source and the detector. Thirdly, the apparatus taught by the EP'905 Patent requires a third grating (G3), which is fixed relative to the source and detector, in

order to recombine the diffraction beams and create the interference beam as shown in Figures 1 and 3. Consequently, the apparatus taught by the EP'905 Patent requires more parts than the present invention and the EP'905 apparatus is not amendable to miniaturization and integration with the light source and detector as is the apparatus in accordance with the present invention. As illustrated in Figure 5 of the '691 Patent, the present invention does not necessarily require a third grating and the first and second diffractive gratings are reflective.

40. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed by me to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

DATED: 16 March 2004

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**POWER OF ATTORNEY
and
CORRESPONDENCE ADDRESS
INDICATION FORM**

Application Number	Reissue of 6,358,691 B2
Filing Date	March 18, 2004
First Named Inventor	Olivier M. PARRIAUX
Title	DEVICE FOR MEASURING TRANSLATI
Art Unit	Unknown
Examiner Name	Unknown
Attorney Docket Number	ICBD166

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☐ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)

SIGNATURE of Applicant or Assignee of Record

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NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

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